REMARKS

In the above reference case, Claims 1-18 are pending. Applicant thanks for the Examiner's thorough examination of the pending claims and thoughtful comments. Applicant will sequentially address the issues raised by the Examiner.

I. Amended Claim Status

The preamble of Claims 1, 7-12 is amended for better readability. New claims 13 and 14 are added. Since all of the limitations recited in claims 13 and 14 are included in claims 1 and 2, no new matters have been added, hence no new search is warranted.

II. The 35 U.S.C. §101 Rejections

Claims 1-12 were rejected under 35 U.S.C. §101 as allegedly being directed to non-statutory matter. Applicant respectfully traverses the rejections

A. *prima facie* case

A portion of the section 2106[II (A)] of the MPEP is reproduced as follows:

> [s]ee *In re Warmerdam*, 33 F.3d 1354, 1360, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459. **Office personnel have the burden to establish a *prima facie* case** that the claimed invention as a whole is directed to solely an abstract idea or to manipulation of abstract ideas or does not produce a useful result. Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. 101. Compare *Musgrave*, 431 F.2d at 893, 167 USPQ at 289; *In re Foster*, 438 F.2d 1011, 1013, 169 USPQ 99, 101 (CCPA 1971). Further, when such a rejection is made, **Office personnel must expressly state how the language of the claims has been interpreted to support the rejection**.
> (emphasis added)

Applicant respectfully submits that the Examiner did not establish a *prima facie* case. In the OA, there are only conclusive statements in pages 2-3, no reason or rationale was stated. If the Examiner were to maintain the 101 rejection after this amendment, Applicant respectfully requests that the Examiner present a *prima facie* case.

B. 35 U.S.C. §101 is very broad

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35 U.S.C. §101 is broad and general in its language describing patentable subject matter: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title." Patentable statutory subject matter is seen to be either a useful "process", "machine", "article of manufacture" or "composition of matter". Thus, this statue limits patent protection to inventions that possess a certain level of real world value as opposed to those that just represent nothing more than an idea or concept.

The new USPTO guidelines for the examination of inventions related to computer software (See M.P.E.P. 2106 – Patentable Subject Matter, Computer-related Inventions) indicate that there are three general ways whereby software can be used in an invention to satisfy the statutory subject matter requirement. First, software can be used to create a "machine" when a computer is included in the claims as having its operation controlled by the software, as illustrated in the *In re Aappat*. Second, software can be claimed as a "process" when it is described as a series of operational steps to be performed on or with the aid of a computer. And finally, a computer-readable memory (e.g., floppy disks, CD-ROM, system memory) containing the software that can be used to direct a computer to function in a particular manner can be considered as an "article of manufacture".

Applicant submits that claims 1-6 are directed to <u>a series of operational steps</u>(not necessarily in that order) to be performed on or with the aid of a computer. And amended claims 7-12 are directed to a computer read-able memory containing software. For example, the first operational step in claim 1, "obtaining in a computing device a plurality of finite element analysis results", clearly indicates that a plurality of

finite element analysis results is obtained in a computing device, and the rest of operations are performed with the aid of a computer. As indicated in the background section [0002] of the specification, finite element analysis is a computerized method widely used in industry. It might be mentally possible to "calculate structural responses for a very simple structure", but it is impossible to realize "obtaining finite element analysis responses" without a computer or the aide of a computer. Also the feature "finite element analysis results" recited in claims 1 and 7, is evident to those skilled in the art that it has to be done with a computer. Accordingly, claims 1-12 are believed to satisfy the statutory subject matter requirement. Applicant respectfully requests the Examiner to withdraw the rejection of claims 1-12 under 35 U.S.C. §101.

C. Useful, concrete and tangible result

Even if the 101 rejection by the Examiner were valid, Applicant respectfully submits that there is useful, concrete and tangible result in the claimed invention based on the remarks below.

The use of finite element analysis in designing a structural product is defined in the paragraph [0003] of the specification of the instant application. A portion of that paragraph is reproduced as follows:

> FEA had it beginnings as a method for structural analysis, but today is routinely used in the design of motors, generators, magnetic resonance imaging systems, aircraft engine ignition systems, circuit breakers and transformers, to name but a few; its techniques are used to analyze stress, temperature, molecular structure, electromagnetic fields, car crash, metal stamping, physical forces, etc. in all sorts of physical systems

Accordingly, it is clear that finite element analysis has a wide range of practical applications, and is used by engineers around the world regularly to reduce design time and create better products (i.e., car, airplane). The structural responses can be calculated using a number of finite element analyses. In addition, the present invention discloses a method and system to distinguish the effects due to bifurcation

(buckling) in portion of a structural product from the effects due to design parameters. Therefore, the claimed invention as a whole undoubtedly possesses a high level of "real world" value (i.e., design a better product such as cars and airplanes). The regular use and commercial value of finite element analysis and software or systems performing the analysis, according to the present invention, or the prior art for that matter, illustrates that the present invention produces a "useful, concrete and tangible" result to have a practical application. In other words, the design optimization in the present invention uses the structural responses from a number of finite element analyses to fine tune or create the best possible product (e.g., cars) – a real world value. In addition, the present invention provides a method and system to determine whether the outliers predicted from a metamodel is normal (i.e., design variable changes) or abnormal (i.e., bifurcation). In order for an engineer to make proper decision in designing a product (e.g., a car, a telephone, etc. – real world value), it is critical to distinguish what causes the outlier predicted from a metamodel. Furthermore, section 2106 (IV) of the MPEP, which directly addresses how to determine "whether the claimed invention complies with 35 U.S.C. §101" has its first point: "A. Consider the Breadth of 35 U.S.C. §101 Under Controlling Law", a portion of which is reproduced below.

As the Supreme Court has held, Congress chose the expansive language of 35 U.S.C. 101 so as to include "anything under the sun that is made by man." *Diamond v. Chakrabarty*, 447 U.S. 303, 308-09, 206 USPQ 193, 197 (1980). Accordingly, section 101 of title 35, United States Code, provides:
> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
In *Chakrabarty*, 447 U.S. at 308-309, 206 USPQ at 197, the court stated:
In choosing such expansive terms as "manufacture" and "composition of matter," modified by the comprehensive "any," Congress plainly contemplated that the patent laws would be given wide scope. The relevant legislative history also supports a broad construction. The Patent Act of 1793, authored by Thomas Jefferson, defined statutory subject matter as "any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement [thereof]." Act of Feb. 21, 1793, ch. 11, § 1, 1 Stat. 318. The Act embodied Jefferson's philosophy that "ingenuity should receive a liberal encouragement." V

Writings of Thomas Jefferson, at 75-76. See *Graham* v. *John Deere Co.,* 383
U.S. 1, 7-10 (148 USPQ 459, 462-464) (1966).
.. Thus, it is improper to read into section 101 limitations as to the subject matter
that may be patented where the legislative history does not indicate that
Congress clearly intended such limitations.
Alappat, 33 F.3d at 1542, 31 USPQ2d at 1556.

In addition, it has been recently held that computer implementation is
not necessary for eligibility of a claimed method, and that, in other
words, there is no separate "technological arts test" or technological
requirement within 35 U.S.C. §101. See *Ex Parte* Lundgren, BPAI No.
2003-2088. For the convenience of the Examiner, this opinion can be
found at:

http://docs.law.gwu.edu/facweb/claw/XpLundgren.htm

Therefore, Applicant respectfully submits that the pending claims fulfill
both the letter and purpose of 35 U.S.C. §101.

III.   The 35 U.S.C. § 102(b) Rejections

Original Claims 1-12 were rejected under 35 U.S.C. § 102(b) as allegedly
being anticipated by a Ph.D dissertation titled: "Modeling, Analyzing, and
Optimization of Cylindrical Stiffened Panels for Reusable Launch Vehicle
Structures" written by Venkataraman at University of Florida, 1999
(hereinafter "Venkataraman"). Applicant respectfully traverses the rejections.

   A. Independent Claim 1

      It is axiomatic that the cited reference in a §102 rejection must teach
      every element of the claim. MPEP 2131. Claim 1 is reproduced as
      follows:

         1. A method for distinguishing effects due to bifurcation from effects due to design
            variable changes used in finite element analysis for designing a structural
            product, the method comprising:

            obtaining in a computing device a plurality of finite element analysis responses
               for a set of design experiments, wherein each of the set of design
               experiments has a specific combination of design variables values;
            constructing a metamodel from the plurality of finite element analysis
               responses; and

selecting __a set of outliers__ from the set of design experiments whose finite
element analysis responses are not predicted by the metamodel.
(emphasis added)

Based on the arguments below, Applicant respectfully submits that the
multiple steps recited in Claim 1 are not anticipated by Venkataraman.

a. Overview of Venkataraman

Venkataraman discloses a software program, PANDA2, that
facilitates the second objective of the dissertation: "to illustrate the
effect of laminate model choice on design optimization. Stiffened
composite panels often require a variety of global and local analysis
models and approximations. Simplified modeling and approximation
can affect the optimization results if used without proper
constraints". (Page 6 Objectives of the Dissertation, Venkataraman)

1. Venkataraman does NOT disclose the step of "selecting a
set of outliers .."
In page 4 of the OA, the Examiner asserts that the step
"selecting a set of outliers .." is allegedly anticipated by
Venkataraman (pg. 56, 121-123, 135-137, 154-157).
Applicant respectfully disagrees. "Selecting a set of outliers
.." is not disclosed, taught nor suggested in the pages cited
by the Examiners or for that matter anywhere in
Venkataraman.
In the present invention, a metamodel is constructed to
predict or approximate the structural responses calculated
by finite element analyses. Then a set of outliers can be
selected from the structural responses predicted or
approximated by the metamodel to determine whether a
bifurcation has occurred in the structural responses of a
design. The outlier is defined in the paragraph [0034] of the
instant application as follows:

Outlier is defined as an observation whose value differs from the value expected or predicted for the specific combination of design variable values (i.e., a specific design experiment). The expected or predicted value of the observation is computed using a metamodel. The actual value of the observation is computed using FEA software.

Contrary to the present invention, Venkataraman <u>does NOT teach, disclose, nor suggest "select a set of outliers"</u>. Venkataraman discloses a typical design optimization for a stiffened panel. Venkataraman does NOT teach how to distinguish bifurcation among <u>a set of outliers</u> from a plurality of approximated responses predicted by the metamodel. Therefore, Venkataraman does not disclose, teach nor suggest the step "<u>selecting a set of outliers</u> .." in Claim 1. To be more specific, Venkataraman did not disclose, teach nor suggest that a set of outliers predicted from a metamodel is due to bifurcation or buckling. Venkataraman teaches that the metamodel, when used correctly, predicts buckling load (i.e., a force) of a stiffened panel.

Based on the above remarks, Applicant believes Claim 1 shall be allowable over the cited references. Reconsideration of Claim 1 is respectfully requested.

B. <u>Independent Claim 7</u>

Independent Claim 7 incorporates similar features recited in Claim 1 and were rejected for the similar reasons as for Claim 1. Applicant would like to apply the above remarks for Claim 1 to support Claim 7 also.   Reconsideration of Claim 7 is respectfully requested.

C. <u>Claims 2 and 8</u>

<u>In section 3.2 of page 4 of the OA, the Examiner's assertion is reproduced as follows:</u> "Venkataraman teaches the steps of: identifying high likelihood bifurcation region by plotting an indicating quantity of

the finite element responses of the set of outliers (pg. 128-130, 174); and examining the finite element responses of maximum and minimum of the set of outliers (pg. 67, 137, 147-157)."   Applicant respectfully disagrees with the above assertion by the Examiner, because there is no evidence of the allegedly teaching in the pages or anywhere else in Venkataraman.   If the Examiner should maintain the same 102 rejection, Applicant respectfully requests that the Examiner to specifically cite the paragraphs in Venkataraman.

D. Dependent Claims

Dependent Claims 2-6 that are dependent upon Claim 1, and Claims 8-12 that are dependent upon Claim 7, contain additional limitations further distinguish them from Venkataraman. Therefore, Claims 2-6 and 8-12 shall be allowable for at least the reasons stated above with regard to independent Claims 1 and 7, respectively.

IV. The 35 U.S.C. § 102(e) Rejections

Original Claims 1 and 7 were rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Moler U.S. Patent No. 6,879,087 (hereinafter "Moler"). Applicant respectfully traverses the rejections.

A. Independent Claim 1

It is axiomatic that the cited reference in a §102 rejection must teach every element of the claim. MPEP 2131. Claim 1 is reproduced as follows:

> 1. A method for distinguishing effects due to bifurcation from effects due to design variable changes used in finite element analysis of an optimization of a structural product design, the method comprising:
>
> obtaining a plurality of finite element analysis responses for a set of design experiments, wherein each of the set of design experiments has a specific combination of design variables values;
> constructing **a metamodel** from the plurality of finite element analysis responses; and
> selecting **a set of outliers** from the set of design experiments whose finite element analysis responses are not predicted by the metamodel.

(emphasis added)

Based on the arguments below, Applicant respectfully submits that the multiple steps recited in Claim 1 are not anticipated by Moler.

a. Overview of Moler

Moler discloses an apparatus for moving a pair of opposing surfaces in response to an electrical activation. (Moler Summary Col.1 Lines 42-44)

1. Moler does not disclose "constructing a metamodel.."

In page 5 of the OA, the Examiner asserts that the step "constructing a metamodel .." is allegedly anticipated by Moler (fig. 7,8, col.9 line32-col.10 line 24). Applicant respectfully disagrees. Constructing a metamodel is not disclosed, taught nor suggested in the cited locations by the Examiner or anywhere in Moler. In the present invention, a metamodel is constructed to predict or approximate the structural responses calculated by finite element analyses. Contrary to the present invention, Moler does not use metamodel at all. Fig. 7 of Moler shows a flowchart illustrates the optimization of the orientation of the hinge members of the mechanical support. (lines 32-34 col. 9 Moler). In Fig. 7 of Moler, a finite element analysis is shown to calculate the responses of the configuration in each iteration directly. Therefore, Moler does not disclose, teach nor suggest the step "constructing a metamodel .." in Claim 1.

2. Moler does not disclose "selecting a set of outliers.."

In page 5 of the OA, the Examiner asserts that the step "selecting a set of outliers .." is allegedly anticipated by Moler

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(fig. 7 col.9 line32-col.10 line 24). Applicant respectfully disagrees. <u>Selecting a set of outliers</u> is not disclosed, taught nor suggested anywhere in Moler. In the present invention, a metamodel is constructed to predict or approximate the structural responses calculated by finite element analyses. Then a set of outliers can be selected from the structural responses predicted or approximated by the metamodel to determine whether there is a bifurcation in the structural responses of the design or not

Contrary to the present invention, <u>Moler does NOT use metamodel thus no outlier to be selected</u>. Therefore, Moler does not disclose, teach nor suggest the step "selecting a set of outliers .." in Claim 1.

Based on the above remarks, Applicant believes Claim 1 shall be allowable over the cited references. Reconsideration of Claim 1 is respectfully requested.

B. <u>Independent Claim 7</u>

Independent Claim 7 incorporates similar features recited in Claim 1 and was rejected for the similar reasons as for Claim 1. Applicant would like to apply the above remarks for Claim 1 to support Claim 7 also. Reconsideration of Claim 7 is respectfully requested.

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<u>Summary</u>

In summary, none of the cited references, viewed alone or in combination, have taught or suggested the combined features recited in the pending claims. In view of the above remarks, Applicants believe that Claims 1-14 shall be allowable over the cited references. Early and favorable action is being respectfully solicited.

If there are any questions regarding this amendment, the Examiner is respectfully requested to contact the undersigned at (408)255-6853.

<table>
<tr><td>

I hereby certify that this correspondence is being transmitted to the Commissioner for Patents electronically on the date stated below.

Date: January 4, 2007

Signature: /Roger H. Chu, Reg.# 52745/
       Roger H. Chu

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Respectfully submitted;

/Roger H. Chu, Reg.# 52745/

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